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How can Life Cycle Assessment support the definition of decarbonization strategies: lessons learnt from the GreenHeatEAF project

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Life Cycle Assessment (LCA) is the most widely used methodology to quantify the potential environmental impact of the steelmaking industry, but it can been used to support the investigation of decarbonization strategies in the steel sector.
In this contribution we aim to illustrate how LCA can be used to support the decision-making process within the context of GreenHeatEAF "Gradual Integration of REnewable carbon and alternative non-carbon Energy sources and modular HEATIing technologies in EAF for progressive CO2 decrease"project, funded within the Horizon Europe programme.
Within GreenHeatEAF, the aim is to investigate alternative decarbonization strategies in the Electric Arc Furnace (EAF) process, by means of three options:
• Integration of non-fossil gases flows, which test the use of hydrogen in different blends,
• Fossil C-sources replacement with biomass/biochar;
• Modular and alternative heat recovery, through off-gas or slags.

LCA and Life Cycle Costing (LCC) methods are used in the GreenHeatEAF project to assess the environmental and economic performance of the melting process to evaluate the impact after the implementation of developed scenarios and to be compared to a baseline scenario.
The baseline scenario has been defined for four case studies, including both EAF and Blast Furnace-Basic Oxygen Furnace (BF-BOF) routes and the preliminary results of the LCA have shown that relevant impact categories throughout all four case studies are climate change and fossil resources use. Depending on the baseline technology, impacts on climate change range from a minimum value of 306,5 kg CO2eq/ton of steel to a maximum value of 2.486 kg CO2eq/ton of steel. The relevance of production processes to significant impact categories varies depending on the production technology. Results show that EAF is a common environmental hotspot due to electricity consumption and direct CO2 emissions, demonstrating the importance of the solutions suggested and tested by the present project.

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